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Research Article

Assessment of noise levels in the operation theatre of an industrial hospital-observational study

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Abstract: It is a well known fact that noise is a potential occupational health hazard. In Operation Theater high noise levels are detrimental as it affects short term memory and cause distraction during critical periods. Due to serious health concern of patients and health care providers the National Institute for Occupational Safety and Health (NIOSH) USA; recommend that the noise intensity in hospital should not exceed 35 dB A (A-weighted setting) during the night & 40 dB A during the day. To get a baseline data of noise level in our operation theatre at Tata Motors Hospital, which is an industrial hospital, we conducted this study. This was an observation study. Sound level meter (Data logging KM929) with auto ranging between 30dB (A) to130 dB(A) was used for recording of noise levels. Noise levels were recorded in operation theaters (1to 4), post-anesthetic care unit (PACU) and in pre operative reception area (PORA). Data was recorded and mean values with (± SD) were calculated. The Mean noise level in the OT one to four was 61.81 ±12.524 dB (A), 74.46 ±13.123 dB (A), 72 ±12.197 dB (A), and 70 ±11.24dB (A) respectively. In PORA it was 76.28± 11.661dB (A), and in PACU noise level was 66.89± 9.3347dB (A).We conclude that, noise levels of 60 dB (A) to 75 dB (A) in our OT complex were higher than recommended. The levels are related to movements of man and machine and its under-rated pollution even in our OT complex of an industrial hospital.
Keywords: Occupational health hazard, NIOSH, PACU, PORA

INTRODUCTION

Noise means, "wrong sound in the wrong place at a wrong time", and it is a well-known fact that noise is a potential occupational health hazard because of its deleterious effect on hearing [1]. In Operation Theater (OT), it affects short-term memory and causes distraction during critical periods. Excessive noise has detrimental effect on patients & causative of increase mistakes by healthcare personnel [2-4].

The National Institute for Occupational Safety and Health (NIOSH) USA recommend, the noise intensity in hospital should not exceed 35 dB A (A-weighted setting) during the night and, 40 dB A during the day.[5, 6]Due to quality concerns of health care system and health of patients, many hospitals in India and abroad have done study to know the level of noise in their operation theatres and used measures to control it [7-10]. Our patients (scheduled for surgery) and their relatives (persons accompanying them to OT) have registered their concerns about noise in OT. However, working staff of our OT including doctors were reluctant to accept it. As we did not have any record or data to know the noise levels in our OT therefore, we conducted this study to know the current noise level of OT, which can help us to analyze, and plan to control it if a noise level comes out to be higher than recommended.

METHODS

It was an observational study conducted at Tata Motors Hospital Jamshedpur, during February and March 2015, after approval from hospital authorities and ethics committee. Tata Motors Hospital, Jamshedpur is a 400 bedded industrial hospital. There are four operation theatres, preoperative reception and preparation room and also post-anesthetic care unit (PACU) in one premise called OT complex. Sound level meter (Data logging KM929) (Fig-1), with auto ranging between 30dB (A) to130 dB (A) was used for recording of noise levels. Noise levels were recorded in all four operation theaters (OT-1 to OT- 4) and sound level meter was placed at anesthesia machine in all the theatres. In post-anesthetic care unit (PACU) it was placed at nursing station and in pre operative reception area (PORA) at telephone station. Recordings were made from 8AM to 10AM at 10 minutes interval over 6 consecutive days (Monday to Saturday) for 4 consecutive weeks and their mean values were taken [8].

RESULTS

The Mean noise level in the OT one to four was 61.81 ±12.524 dB (A), 74.46 ±13.123 dB (A), 72 ±12.197 dB (A), and 70 ±11.24dB (A) respectively. In PORA it was 76.28± 11.661dB (A), and in PACU noise level was 66.89± 9.3347dB (A).

Fig-1: Sound Level Meter

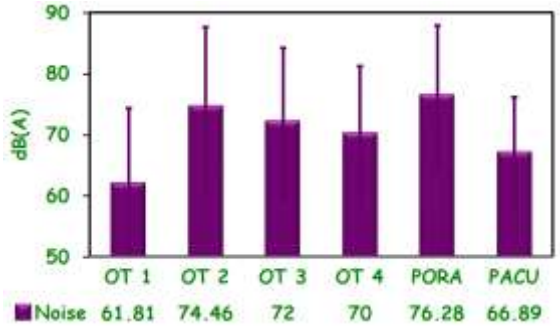

Fig-2: Minimum and maximum noise Levels recorded in operation theatres (OT-1 to OT-4), Preoperative reception area (PORA) and Post-anaesthesia care unit (PACU)

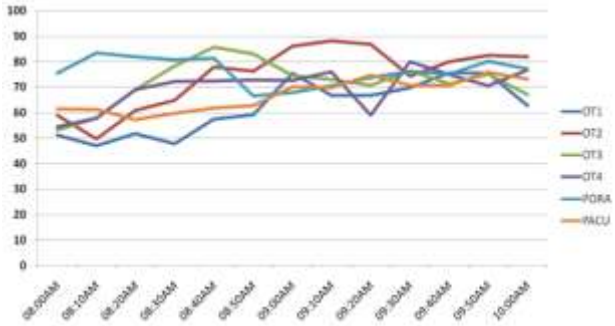

Fig-3: Pattern of noise variation during recording at various locations, high levels during patient reception and preparation before surgery

Table-1: Comparison of noise levels of our study with other published data

	Minimum noise level (Mean) dB(A)	**Maximum noise level (Mean) dB(A)**
Tata Motors Hospital 2015	61.8	76.2
Kam PCA, Anaesthesia 1994	53	75
Murthy VSSN, Canada J Anesthesia 1995	55	77.4
Singh SA, NMJI 2006	59	70

DISCUSSION

Sound pollution (high noise levels) in operation theatre is universal problem and not specific to specialized centers or technology driven hospitals [7-11]. Our result of noise (from industrial hospital) is almost similar to other types of hospital setups (Table-1) [2, 3, 9]. Recorded noise level in our OT complex was in the range of 60-75 dB (A), clearly higher than that recommended 45dB (A) [5, 6]. Highest noise levels were observed at the pre operative reception area (PORA) 77.28dB (A). Among operation theatres it was highest in OT-2 (Fig-2). Noisiest period was during preoperative reception of patient and preparatory phase of surgery (Figure-3). Other studies also have similar observations [9, 10]. It has been observed that exposure of 90 dB (A) for 30 minutes leads to increased urinary excretion of adrenaline and nor adrenaline which continue up to 90 minutes after cessation of noise. This response resembles a severe stress response [12]. Although, observed noise level in our OT complex 60-75 dB (A), was moderately high, is also not benign. Because of the logarithmic scale noise levels of 67 dB (A) are roughly equivalent to a noise 10 times the recommended level of 35 dB (A) [11]. Increase in baseline values of noise by 10-20 % (40-45 dB (A)) causes awakening or changes in EEG stage of sleep and sleep deprivation. This can lead to psychological effects in patients [12]. Noise levels > 70 dB (A) causes vasoconstriction , increased heart rate , blood pressure and cardiac arrhythmias [12].

Sudden unexpected noise as little as 30dB (A) above the background level can cause a 'startle reaction' among operating theatre staff [13].In present study noisiest period was during preoperative reception of patient and preparatory phase of surgery. This is time when maximum movements of trolleys and, personnel conversation take place. In OT-2 the noise level was highest among other theatres. This OT is used for major surgical operations and also learning place for junior doctors as an observer. More number of occupants and (often discussions) might be contributing factors for high noise [14]. Evidences have pointed out that the personnel's behavior and poor maintenance of equipment is major producer of noise in operation theatres [9, 10]. It has been observed that even low intensity noise like unnecessary conversation in the background interferes with performance to a greater extent than do other types of noise [1, 8, 12]. Recent research has added a new dimension to OT noise by finding out its relation with surgical site infection [15]. Although, it was not in the scope of present study we also have similar opinion. However, in further studies, we have to find out the cause-impact relation of noise in our OT.

CONCLUSION

We conclude that, noise levels were higher than recommended in our OT complex. The levels are related to movements of man and machine and its under-rated pollution even in our OT complex of an industrial hospital.

Accepted short comings of this study & way forward

It was an observation study with manual recording/ data entry. This has high potential for bias. Short duration and unknown impact coefficient is also limitation of this study. However, this study has pointed out that high noise levels are common concern and not limited to any specific type of work environment.

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